2011-2012 Lesson Plan for Henrico 21 Awards

Lesson Title: Central Location
Submitted By: Pete Anderson
School: Glen Allen High School
Target Grade/Subject: Geometry
Length: 90 minutes

Summary: This lesson explores the difference between theoretical solutions and practical solutions by using "Points of Concurrency" which is an extension of the Geometry SOL topic of "Constructions". Therefore constructions must be taught prior to this lesson. Students, in small groups**,** will begin with a PBL activity of exploring the application of an SOL construction to a triangle. Students are then presented with the day's problem: ***Determine a centralized location for a warehouse that will service 3 local grocery stores.*** After brainstorming on what information is needed to solve the problem, (question the question) students submit their questions via ActivEngage. The Teacher then leads to the students through directions on how to locate the stores using Google Earth and inserting a graphic of the map into Sketchpad. Students' apply what was learned from the PBL activity to this situation and then asked to respond to questions that ultimately lead to the essential question: ***Is a mathematical solution practical?***

Essential questions:

- Is a mathematical solution practical?

Lesson Development:
Process/Tasks/Assessment: *(Describe what the teacher and students are doing during this lesson. Include details about particular tasks and essential resources/tools. Include a description of the artifact that you will collect as evidence of content/skill mastery and state how you will communicate your assessment expectations to the students.)*

PROBLEM
Determine a centralized location for a warehouse that will service 3 local grocery stores.
Examples: Martins, Food Lion, Kroger, Target, Wal-Mart
Group: What questions do you have about the problem?
ActivEngage: Share these questions. One person per question.

Opening Activities:

Description: Sketchpad Activity - This activity allows the student to experiment with the geometric situation that the lesson is based on: a triangle inscribed within a circle. The warm allows the student to experience the problem before the teacher defines the problem.

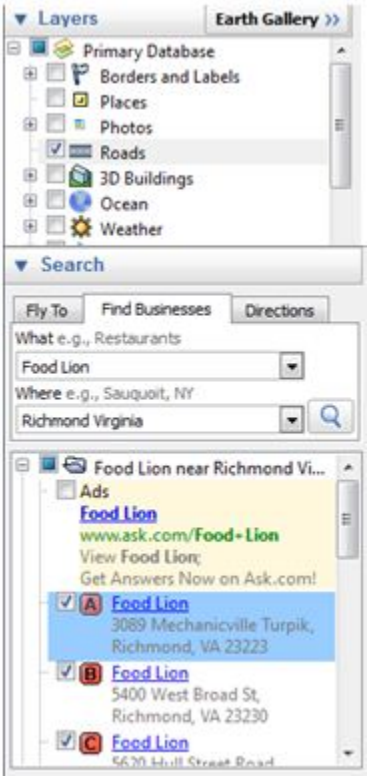
- Students: Download the Sketchpad File "***CentralLocations.gsp***". Save the file with you name and block number in the file name. Leave this file open throughout the lesson. Go to the "Warm-Up Challenge" and do both tasks. Work in small groups.

1. Easy: Given a circle, inscribe a Triangle
2. Difficult: Given a Triangle, circumscribe the circle.

- After a couple of minutes the teacher calls on a couple of groups to share their findings and difficulties in solving the 2nd part of the warm-up.

Learning Activities (the body of the lesson)

- How to circumscribe a circle about a triangle (a.k.a. finding the circumcenter)
  - Students are given access to a “how to” video on doing this construction using Sketchpad. The teacher checks their work and demonstrates the connection to the previously learned SOL construction of creating the “perpendicular bisector”. This construction is required to complete the following activity.
- Google Earth: The teacher walks the students through the following step by step instructions. These directions available to the student on a separate page of the sketchpad file.
  - Open ***Google Earth***
    - Layers: Only “Roads”
    - Under the “Search” option, choose the “Find Business” tab
    - What : (the name of the grocery store)
    - Where: (Richmond Virginia)
    - Choose (check) three locations
    - Remove (uncheck) all others
    - Zoom in or out so as to be able to see all three locations clearly.
  - Open the ***Snipping Tool*** software
  - Select the region of Google Earth that contains the three store locations. Copy the image. (control-C)
  - Paste the map into the appropriate page of the lesson’s Sketchpad file.
  - Construct the center of the circle that contains the three store locations. Use the appropriate construction technique.
  - Find this location on Google Earth.



Closing Activity

- Students answer the following questions found on the Sketchpad file.
  - Where is your geometrically central location?
  - Is this location available to build a warehouse?
  - If not, where is the next closest location?
  - Is this location a good solution to the problem? Explain.
  - **Where would you build the warehouse? Why?**
- The Sketchpad file is uploaded to a class dropbox and 2 to 3 students are chosen to share their findings. The Teacher shows the student file on the screen.
- The teacher facilitates class discussion that leads to answering the essential question: ***Is a mathematical solution practical***?

Examples of Student Work:

- http://teachers.henrico.k12.va.us/glenallenhs/anderson_p/StudentWork1_CentralLocation.gsp

TIP Chart Assessment:
(Using the TIP Chart, identify which level (e.g. entry, developing, approaching, ideal/target) your lesson falls in for each of the categories below and write a brief statement to describe what the students are doing as it relates to the indicators on the TIP chart.)

Categories:
Research and Information Fluency: **Developing**
Students are applying the search techniques in Google Earth as directed by the teacher. Students are also responding to questions that require analysis of the data available in Google Earth.

Communication and Collaboration: **Developing**
Students discuss in small groups the what information may be needed to solve the problem and use ActivEngage as a digital tool to communicate their ideas and questions to the teacher and other students in the class.

Critical Thinking and Problem Solving: **Ideal/Target**
In the "difficult" warm-up question, students apply previous knowledge to attempt to solve a geometry problem that they have not experienced. Students generate questions about the problem posed by the teacher. Students use The Geometer's Sketchpad software to solve the mathematical question and then then apply the solution to the data available on Google Earth to determine the practicality of their solution. They then justify and alter their mathematical solution. In the closing activity, the students reflect on the experience and discuss the essential question, "Is a mathematical solution practical?"

Creativity and Innovation: **Approaching**
With the chosen technology, students analyze the problem, create an original, mathematical solution, and question that solution. Through guiding questions, students are prompted to decide if their mathematical solution is practical and- if not- come up with a new more practical solution.